basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ANNUAL NATIONAL ASSESSMENT 2013
GRADE 9 MATHEMATICS EXEMPLAR MEMORANDUM

KEY	
M	Method mark
CA	Consistent Accuracy mark
A	Accuracy mark

1. MULTIPLE CHOICE QUESTIONS

1.	1.1	**B**	1.2	**D**	1.3	**C**	1.4	**C**	1.5	**D**	Give 1 mark for each correct answer.	**[10]**
	1.6	**C**	1.7	**D**	1.8	**D**	1.9	**D**	1.10	**A**		

2. NUMBERS, OPERATIONS AND RELATIONS

2.1.1 0,0067 ✓ **A** — 1 mark (1)

2.1.2 $-16 - 12 - 18 + 2 = -44$✓✓✓✓ — Substitution: 1 mark; Simplifying: 2 marks; Answer: 1 mark (4)

2.2 $7{,}125 \div \sqrt{25}$
$= 7{,}125 \div 5$ ✓ **M**
$= 1{,}425$ ✓ **CA** — 5: 1 mark; Answer: 1 mark (2)

2.3 96:120
= 8:10✓
= 4:5✓**A** — 8:10: 1 mark; Answer: 1 mark (2)

2.4 $s = \frac{d}{t}$✓ **M** — formula: 1mark

$80 = \frac{d}{3}$✓ **M**
$d = 240km$✓**CA**
$s = \frac{d}{t}$
$50 = \frac{240}{t}$ ✓ **M**
$t = 4{,}8hrs$✓**CA** **or** 4 hours 48 minutes

substitution: 1 mark

Answer for d: 1 mark

substitution: 1mark

Answer for t: 1mark (5)

2.5 $A = P(1 + i)^n$✓ **M**
$= R6\,500(1 + 0{,}075)^3$✓**M**
$= R8\,074{,}93$✓ **CA**
or
Year 1: $R6\,500 \times 7{,}5\% = R487{,}50$
Year 2: $R6\,987{,}50 \times 7{,}5\% = R524{,}06$
Year 3: $R7\,511{,}56 \times 7{,}5\% = R563{,}37$ ✓✓**M**
The amount will be R8 074,93 ✓**CA**

Interest = R8 074,93 – R6 500✓**M**
$= R1\,574{,}93$ ✓**CA**

formula: 1mark
substituting: 1mark
Answer for A: 1 mark
Calculating interest: 1 mark
Answer: 1 mark (5)

2.6.1 $20\%\ of\ P = R35\ 000$

$\frac{1}{5}P = R35\ 000$ ✓ **M**

$P = R175\ 000$ ✓**CA**

$\frac{1}{5}P = R3500$: 1 mark

Answer: 1 mark (2)

2.6.2 Amount still to be paid = $R175\ 000 - R35\ 000$

$= R140000$ ✓**A**

Answer: 1 mark (1)

2.6.3 $A = P(1 + in)$ ✓ **M**

$= R140\ 000(1 + 0{,}1 \times 4)$✓✓ **M**

$= R196\ 000$ ✓ **CA**

∴ monthly installment = $R196\ 000 \div 48$ ✓ **M**

$= R4\ 083{,}33$ ✓**CA**

formula: 1mark

substituting $n = 4$: 1mark

substituting $i = 0{,}1$: 1mark

Answer for A: 1 mark

Dividing A by 48: 1 mark

Answer: 1 mark

or

10% of $R140\ 000$ $= R14\ 000$ ✓✓ **M**

$R14\ 000 \times 4$ years $= R56\ 000$ ✓ **M**

$R140\ 000 + R56\ 000 = R196\ 000$✓**M**

$R196000 \div 48\ months = R4083{,}33\ per\ month$ ✓✓**M/ CA**

$R14\ 000$: 1 mark

× 4 years: 1 mark

$R56\ 000$: 1 mark

Answer for A: 1 mark

Dividing A by 48: 1 mark

Answer: 1 mark (6)

2.7 $\frac{5}{3} : \frac{8}{3} = 5 : 8$✓✓

Answer: 2 marks (2)

2.8 Amount = $R155{,}50 \times \frac{6}{10}$✓✓

$= R93{,}30$✓

Calculation:2 marks

Answer: 1 mark (3)

2.9 $p.n.i = SI$ ✓

$3000(n)(0{,}8) = 960$ ✓

$n = 4$ ✓

or

$A = P\ (1 + ni)$✓

$3960 = 3000(1 + 0{,}08n)$✓

$0{,}32 = 1 + 0{,}08n$

$0{,}32 = 0{,}08n$

$n = 4$✓

Formula: 1 mark

Substitution: 1mark

Answer: 1 mark (3)

2.10 $A = P(1 + i)^n$ ✓

$A = R10\ 000(1 + 0{,}1)^3$✓

$= R13\ 310{,}00$✓

Formula: 1 mark

Substitution: 1mark

Answer: 1 mark (3)

3. PATTERNS, FUNCTIONS AND ALGEBRA

3.1.1 $(2x)^2 + 3x^2$

$= 4x^2 + 3x^2$ ✓ **M**

$= 7x^2$ ✓ **CA**

$4x^2$: 1 mark
Answer: 1 mark
(2)

3.1.2 $2x^{-2} \times \frac{x^3}{2^2}$

$= \frac{x}{2}$ ✓✓ **A**

Numerator: 1 mark
Denominator: 1 mark
(2)

3.1.3 $\frac{4x^{-2}}{(4x)^{-2}}$

$= \frac{4x^{-2}}{4^{-2}\,x^{-2}}$ ✓ **M**

$= 4^3$ ✓ **CA**

$= 64$ ✓ **A**

$4^{-2}x^{-2}$: 1 mark
4^3: 1 mark
Answer: 1 mark
(3)

3.2.1 $3a^2bc^2(3a^2 - 4b - c)$

$= 9a^4bc^2$✓ $- 12a^2b^2c^2$✓ $- 3a^2bc^3$✓**A**

1 mark for each term
(3)

3.2.2 $(2x - 3)(x + 1)$

$= 2x^2 - x - 3$ ✓✓**A**

Answer: 2 marks
(deduct a mark for each error) (2)

3.2.3 $a^4b^6.\,ab^2$✓

$= a^5b^8$ ✓

a^4b^6 : 1 mark
Answer:1 mark (2)

3.3.1 $10t^2 - 5$

$= 5t$✓$(2t - 1)$ ✓ **A**

$5t$: 1 mark
$2t - 1$: 1 mark (2)

3.3.2 $81 - 100x^2$

$= (9 - 10a)$✓$(9 + 10a)$✓**A**

$9 - 10a$: 1 mark
$9 + 10a$: 1 mark
(2)

3.4.1 $2x - 5 = 5x + 16$

$-3x$✓ $= 21$ ✓ **M**

$x = -7$ ✓ **A**

$-3x$: 1 mark
21: 1 mark
Answer:1 mark (3)

3.4.2 $\frac{(x-2)}{4} + \frac{(2x+1)}{3} = \frac{5}{3}$

× 12

$12\left(\frac{x-2}{4}\right) + 12(\frac{2x+1}{3}) = 12 \times \frac{5}{3}$

$3(x-2)$✓ $+ 4(2x + 1)$✓ $= 4 \times 5$✓ **M**

$3x - 6 + 8x + 4 = 20$ ✓ **M**

$11x = 22$

$x = 2$ ✓ **A**

$3(x - 2)$: 1 mark
$4(2x + 1)$: 1 mark
4×5: 1 mark
Simplifying: 1 mark
Answer: 1mark (5)

3.5 $-16 - 12 - 18 + 2 = -44$✓✓✓✓

Substitution: 1 mark
Simplifying: 2 marks (4)
Answer: 1 mark

3.6 $20a^3b^3 + 8a^2b^2 - 12ab$✓✓✓

$20a^3b^3$: 1 mark
$8a^2b^2$: 1 mark
$-12ab$:1 mark (3)

3.7.1 $(a^4b^6)(ab^2) = a^5b^8$✓✓

(a^4b^6): 1 mark
a^5b^8: 1 mark (2)

3.7.2 $x + y$✓✓ Answer: 2 marks (2)

3.7.3 $\frac{72a^{-3}b^{0}}{9a^{-4}b^{-3}}$✓✓
$= 8ab^{3}$✓
Simplifying: 2 marks
Answer: 1 mark
(3)

3.7.4 $\frac{x-2}{2x} - \frac{x-3}{3x}$
$= \frac{3(x-2)-2(x-3)}{6x}$✓✓
$= \frac{3x-6-2x+6}{6x}$✓
$= \frac{x}{6x}$✓
$= \frac{1}{6}$✓
Simplifying: 4 marks
Answer: 1 mark
(5)

3.7.5 $\frac{4x^2}{2a^2} \times \frac{2a^2}{4x} = x$✓✓ Simplifying: 1 mark
Answer: 1 mark
(2)

3.7.6 $\frac{(x+1)(x-1)}{3(x+1)}$✓✓
$= \frac{x-1}{3}$✓
Difference of two squares: 1 mark
Common factor: 1 mark
Answer: 1 mark (3)

3.8.1 $3a(a^2 - 3a - 2)$✓✓ Common factor$3a$: 1 mark
Factor$a^2 - 3a - 2$: 1 mark
(2)

3.8.2 $(a + b)(4 - x^2)$✓✓
$= (a + b)(2 + x)(2 - x)$✓✓
Common factor: 2 marks
Difference of two squares: 2 marks
(4)

3.9.1 $8x + 3 = 3x - 22$
$8x - 3x = -22 - 3$
$5x = -25$✓
$x = -5$✓
Simplifying:1 mark
Answer: 1 mark
(2)

3.9.2 $x - \frac{x-1}{2} = 3$
$2x - x + 1 = 6$✓
$x + 1 = 6$✓
$x = 5$✓
Multiplying by 2: 1 mark
Simplifying:1 mark
Answer: 1 mark (3)

3.9.3 $3^{x+1} = 3^{4}$✓
$x + 1 = 4$✓
$x = 3$✓
Applying exponential law: 2 marks
Answer: 1 mark (3)

3.10.1 13✓**A** , 17✓**A** 1 mark per term (2)

3.10.2 The number of sides increase by 4 to get the next diagram✓**A** Correct deduction: 1 mark (1)

3.10.3 T_n = 4n + 1✓✓**A** 4n:1 mark
+1: 1 mark (2)

3.11.1

1	2	3	
6	9	12	

15 matches ✓✓ Answer: 2 marks (2)

3.11.2 Tn = 3n + 3✓✓ 3n: 1 mark
3:1 mark
(1 mark per term) (2)

3.11.3 T_{20} = 3(20) + 3 = 63✓✓ Substitution: 1 mark
Answer :1 mark (2)

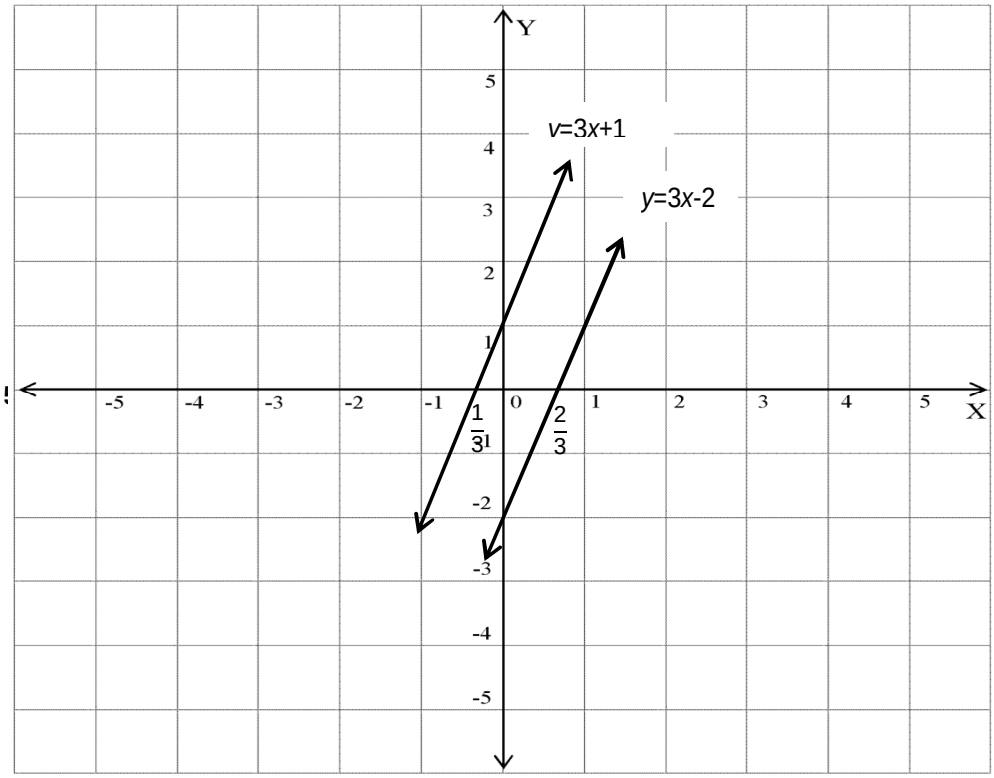
3.12 $y = 2x^2 - 3x + 5$
$= 2(-1)^2 - 3(-1) + 5$✓**M** substitution: 1 mark
= 10✓**CA** Answer: 1 mark (2)

3.13.1 x = 2✓**A** Answer: 1 mark (1)

3.13.2 y = 2x✓✓**A** Answer: 2 marks (2)

3.13.3 (2; −2)✓✓**A** 2: 1 mark
−2: 1 mark (2)

3.14.1



X-intercept: 1 mark per graph✓+✓A
Y-intercept: 1 mark per graph✓+✓A
Correct labelling of graph: 1 mark per graph ✓+✓A

(6)

3.14.2 The lines are parallel **or** the lines will never cut.✓**A** (1)

3.15 $P\ (3;3)$✓ Answer: 1 mark (1)

3.16.1 $Gradient\ of\ AD\ =\ \frac{4}{-2}\ =\ -2 Equation\ of\ AD\ is\ y\ =\ -2x\ +$ 4✓✓

$-2x$: 1 mark
4:1 mark

$$Gradient\ of\ BC\ =\ \frac{4}{-2}\ =\ -2$$

$Equation\ of\ BC\ is\ y\ =\ -2x - 4$✓✓

$-2x$: 1 mark
-4:1 mark (4)

3.16.2 AD || BC ✓
(because the Gradient of AD = Gradient of BC)✓

AD || BC : 1 mark
Reason :1 mark (2)

4. SPACE AND SHAPE

4.1 $\hat{E} = 95° - 30°$ (ext. $\angle$ of ΔCED) ✓**M/ A**
$= 65°$ ✓**A**
or
$\widehat{C_1} = 180° - 95°$ (ext. $\angle$ of ΔCED)
$= 85°$
$\hat{E} + 85° + 30° = 180°$ (sum of $\angle$s of Δ= 180°) ✓**M/ A**
$\hat{E} + 115° = 180°$
$\hat{E} = 65°$ ✓**A**
$\hat{A} + \hat{E} = 180°$ (co - interior <s AB || CD) ✓**M/ A**
$\hat{A} = 115°$ ✓**A**

correct statement with reason:1 mark
Answer for $\hat{E}$: 1 mark
correct statement with reason:1 mark
Answer for $\hat{A}$: 1 mark (4)

4.2 In $\Delta ABD \ and \ \Delta CDB$
$BD = BD$ (Common) ✓**A**
$A\hat{B}D = C\hat{D}B = 90°$ (Given) ✓**A**
$BC = DA$ (Given) ✓**A**
$\therefore \Delta ABD \equiv \Delta CDB$ (90°Hyp S) ✓**A**

correct statement with reason:1 mark
correct statement with reason:1 mark
correct statement with reason:1mark
correct deduction and reason:1 mark (4)

4.3.1 $\widehat{B_1} + \widehat{B_2} + \widehat{C_1} + \widehat{C_2} = 180°$ (co-int $\angle s; AB||DC$) ✓**A**
But $\widehat{B_1} = \widehat{B_2}$ and $\widehat{C_1} = \widehat{C_2}$ (given) ✓**A**
$\therefore 2\widehat{B_1} + 2\widehat{C_1} = 180°$✓**A**
$\widehat{B_1} + \widehat{C_1} = 90°$✓**A**
$\widehat{T_2} = 90°$(sum of $\angle s$ of Δ= 180°)✓**A**

Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Correct deduction: 1 mark
Simplification: 1 mark
Correct deduction with reason: 1 mark
(5)

4.3.2 $\Delta TCP \ ||| \ \Delta BCT$ (AAA)✓✓**A**

Correct statement with reason: 2 marks (2)

4.3.3 $\frac{TC}{BC} = \frac{CP}{CT} = \frac{TP}{BT}$ (prop. sides of similar Δs) ✓**A**

$\frac{TC}{2TC} = \frac{4}{BT}$ $(BC = 2TC)$ ✓**A**

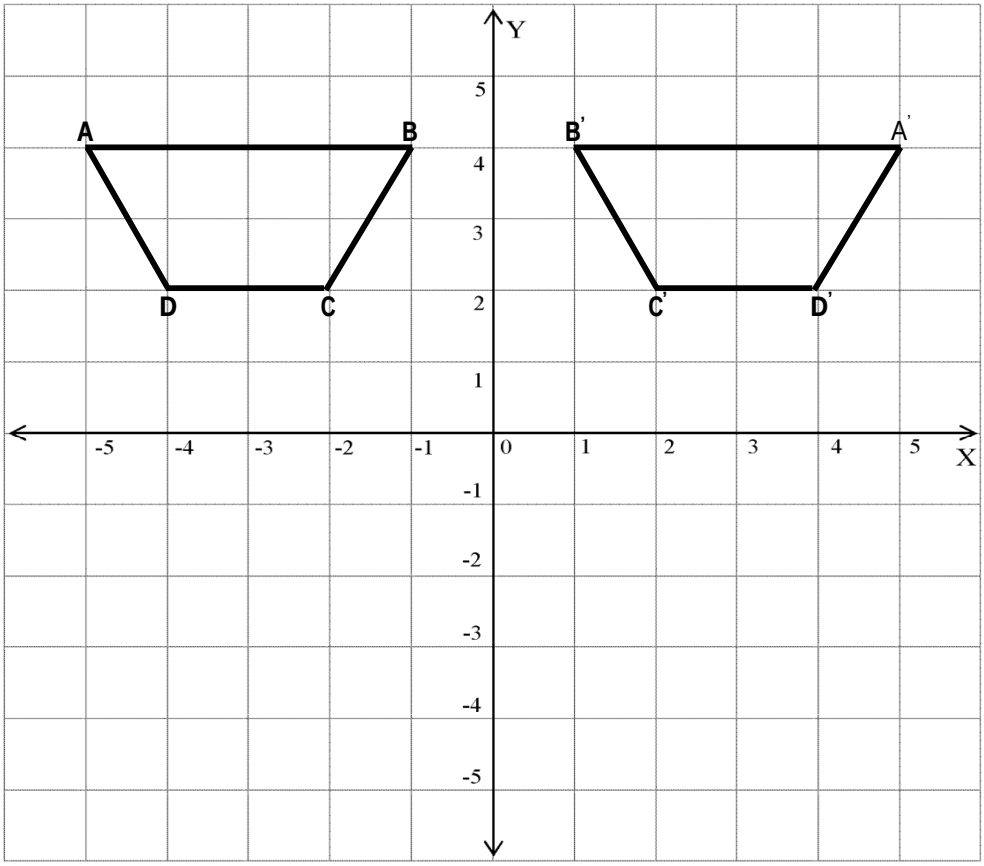
$\frac{1}{2} = \frac{4}{BT}$

$BT = 8 \ cm$✓**A**

Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Answer: 1 mark
(3)

4.4.1 $A(-5;4)$ ✓**A** Correct pair of co – ordinate:1 mark each
$D(-4;2)$✓**A** (2)

4.4.2



correct shape: 1 mark ✓A
correct coordinates of the image: 1 mark ✓A

(2)

4.4.3 $A'(5;4)$ ✓ 1 mark per co - ordinate
$D'(4;2)$ ✓ (2)

4.5 No .of faces : 5✓**A** 1 mark per correct answer
No. of vertices : 6✓**A**
No. of edges : 9✓**A** (3)

4.6 In ΔAEW :

$\hat{E}_2 + \hat{W}_1 = 110°$ (sum of <s of Δ = 180°)✓

but$\hat{E}_2 = \hat{W}_1$(angles opp. equal sides of Δ) Statement with reason: 1 mark

$= 55°$ Statement with reason:1 mark

$x = \hat{W}_1 = 55°$ (alt <s ; CS || HW)✓ Statement with reason:1 mark (3)

4.7.1 In Δ ABD and Δ ACD — statement with reason: 1 mark

AB = AC (given) ✓ — statement with reason: 1 mark

BD = CD (given)✓ — statement with reason: 1 mark

AD = AD (common side)✓ — Correct case: 1 mark

$\therefore\Delta$ ABD ≡ Δ AC (s,s,s)✓ (4)

4.7.2 $\hat{A}_1 = \hat{A}_1$(corr<s of congruent Δs)✓ — Correct statement with reason:1 mark

DA bisects BÂC✓ — Conclusion:1 mark (2)

4.8 $x + 50° + 2x - 20° = 180°$ — Statement with reason: 1 mark

(co-interior<e; AB || CD)✓ — Statement with reason:1 mark

$3x + 30° = 180°$ — x: 1 mark

$3x = 150°$ — B: 1 mark

$x = 50°$ ✓

$\hat{B} + x + 50° = 180°$

(co-interior <e; AC || BD)✓

$\hat{B} + 100° = 180°$

$\hat{B} = 80°$✓ (4)

5. MEASUREMENT

5.1 Surface area $= 6S^2$ ✓**M/ A**

$= 6(6cm^2)$ — Formula/ substitution: 1 mark

$= 216cm^2$ ✓**A** — Answer: 1 mark (2)

5.2.1 Volume of cylinder $= \pi r^2 h$ ✓**M** — Formula: 1 mark

$= \pi \times 9^2 \times 100\ cm^3$ ✓**M** — Substitution: 1 mark

$= 25\,446{,}90\ cm^3$ ✓**CA** — Answer: 1 mark (3)

5.2.2 Volume of rectangular $= lbh$ ✓**M** — Formula: 1 mark

$= 30 \times 14 \times 8\ cm^3$ ✓**M** — Substitution: 1 mark

$= 3\,360\ cm^3$ ✓**CA** — Answer: 1 mark (3)

5.2.3 Number of rectangular prisms $= \frac{volume\ of\ the\ cylinder}{volume\ of\ the\ prism}$ ✓**M** — Formula: 1 mark

$= \frac{25457{,}14}{3360}$ ✓**M** — Substitution: 1 mark

$= 7{,}573\ldots$

$Number\ of\ completed\ prisms = 7$ ✓**CA** — Answer: 1 mark (3)

5.3 $AB^2 = 12^2 + 5^2m^2$ $(Pyth)$✓
$AB^2 = 169\ m^2$ ✓
$AB = 13m$ ✓

Formula/substitution: 1 mark
Calculation: 1 mark
Answer: 1 mark
(3)

5.4 Volume = 5000 cm^3
$\pi r^2 h = 5000$✓
$\pi(20)^2 h = 5000$✓
$h = 4{,}0\ cm$✓

Formula:1 mark
Substitution: 1 mark
Answer: 1 mark
(3)

6. DATA HANDLING

6.1.1 24 passengers ✓**A**

Answer: 1 mark (1)

6.1.2 Range = $(70 - 1)\ years = 69\ years$ ✓**A**

Answer: 1 mark (1)

6.1.3 Mean age = $\frac{total\ ages}{number\ of\ passengers}$
$= \frac{(3+2+15+27+35+4+5+14+45+30+2+37+42+53+33+50+70+15+34+31+2+1+32+59)\ years}{24}$ ✓**M**
$= \frac{644}{24}\ years$✓**M**
$= 26{,}71\ years$
$= 27\ years$ ✓**CA**

Formula/ substitution: 1 mark
Calculations: 1 mark
Answer: 1 mark
(3)

6.2.1 Amount = 19% of $R105\ billion$
$= \frac{19}{100} \times R105\ billion$ ✓**M**
$= R19{,}95\ billion$ ✓**CA**

$\frac{19}{100} \times R105\ billion$: 1 mark
Answer: 1 mark (2)

6.2.2 Percentage = 17% + 14% = 31% ✓**A**

Answer: 1 mark (1)

6.2.3 Amount = (19% + 11%) of $R105\ billion$
= 30% of $R105\ billion$✓**M**
$= R31{,}5\ billion$ ✓**A**
or
Amount = 19% of $R105\ billion$ + 11% of $R105\ billion$
$= R11{,}55\ billion + R19{,}95\ billion$ ✓**M**
$= R31{,}5\ billion$ ✓**A**

30% of $R105\ billion$: 1 mark
Answer: 1 mark
or
19% of $R105\ billion$ + 11% of $105\ billion$: 1 mark
Answer: 1 mark (2)

6.3.1

Stem	Leaves	
0	3 5 6 7 9	✓**A**
1	0 1 1 1 3 3 4 5 7	✓**A**
2	0 1 2 3 3 6	✓**A**

(3)

6.3.2 Range = 26 – 3 = 23 ✓**A**

Answer: 1 mark (1)

6.3.3 Median mark = 13 ✓**A** Answer: 1 mark (1)

6.3.4 Modal mark = 11 ✓**A** Answer: 1 mark (1)

6.4.1

	Win (W)	Draw (D)	Loss (L)	
Win	WW	WD	WL	✓**A**
Draw	DW	DD	DL	✓**A**
Loss	LW	LD	LL	✓**A**

(3)

6.4.2.1 $\frac{1}{9}$✓**A** Answer: 1 mark (1)

6.4.2.2 $\frac{2}{9}$✓**A** Answer: 1 mark (1)

6.4.2.3 $\frac{5}{9}$✓**A** Answer: 1 mark (1)

6.5.1

Class-interval	Tally marks	Frequency
140-144	||||✓	4✓
145-149	|||✓	3 ✓
150-154	𝍸|||| ✓	9✓
155-159	𝍸| ✓	6✓
160-164	𝍸 𝍸✓	10✓
165-169	𝍸✓	5✓
170-174	|||✓	3✓

For each correct interval: 2 marks

(14)

6.5.2 Range = 174 – 140 ✓
= 34✓ Answer:2 marks (2)

6.5.3 160 – 164✓✓ Answer: 2marks (2)

6.5.4 $i_{20} < median < i_{21}$
Class-interval 155 - 159✓✓ Answer: 2marks (2)

7. PROBLEM SOLVING

A	:	B	:	C	:	Total
4	:	3				
		4	:	3		
16	:	12	:	9	:	37

A's share = $\frac{16}{37} \times R148 = R64$ ✓**A**
B's share = $\frac{12}{37} \times R148 = R48$ ✓**A**
C's share = $\frac{9}{37} \times R148 = R36$ ✓**A**
or

C's share = R148 − R112
= R36

Each correct statement: 1 mark

(3)

END